Overview of Load Reduction Estimates for Atmospheric Sources of Pollutants

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Outline of Presentation

- Atmospheric Deposition Pollutant Budget
- Technical Approach
- Pollutant Control Option Evaluation
- Site-Scale Analysis (settings, treatment tiers)
- PCOs Chosen for Atmospheric Pollutants
- Assumptions
- Load Reduction Estimates
- Conclusions

Atmospheric Deposition Pollutant Budget

- Nitrogen: 218 MT/year (55% of N budget)
- Phosphorus: 7 MT/year (15% of P budget)
- Fine Sediment
  - 750 MT/year (5% of FS budget)
  - 75 x 10^{18} particles/year (16% of FS budget)

Technical Approach

- Developed emission inventory to identify major atmospheric sources of pollutants in basin.
  - Extrapolated CARB's 2005 PM, NOx and NH_3 emission inventories for the CA portion of basin to the entire basin based on population & VMT.
  - Modified CARB's estimates based on basin specific source activity data & emission factors.
  - Used basin specific source profile test data to estimate emissions for TP and EC.

Nitrogen Sub-sources (based on updated EI)

- On-road vehicles: 48%
- Off-road equipment: 27% (97% diesel)
- Boating: 7%
- Area Sources: 7%
- Stationary Sources: 5%
- Residential Wood Combustion: 3%
- Aircraft: 2%

FS and P Sub-sources (based on updated EI)

- Unpaved roads: 46%
- Paved roads: 43%
- Construction: 8%
- Residential wood combustion: 2%
- Mobile sources: 1%
- Other sources: 1%

Technical Approach (continued)

- Calculated “transportable fraction” for resuspended soil to account for loss between source and lake.
- Calculated emission reductions using published control measure efficiency values for PCOs for different treatment scenarios.
- Calculated load reductions by multiplying emissions reductions by “transportable fraction” to account for loss of resuspended soil between source and lake.

Pollutant Control Option Evaluation

- Compile list of PCOs for major pollutant sources based on updated emission inventory
  - Pathway Transportation Technical Working Group
  - Pathway Forum
  - California Air Resources Board
  - Western Regional Air Partnership
- Selection of PCOs
  - Effectiveness
  - Viability
  - Applicability

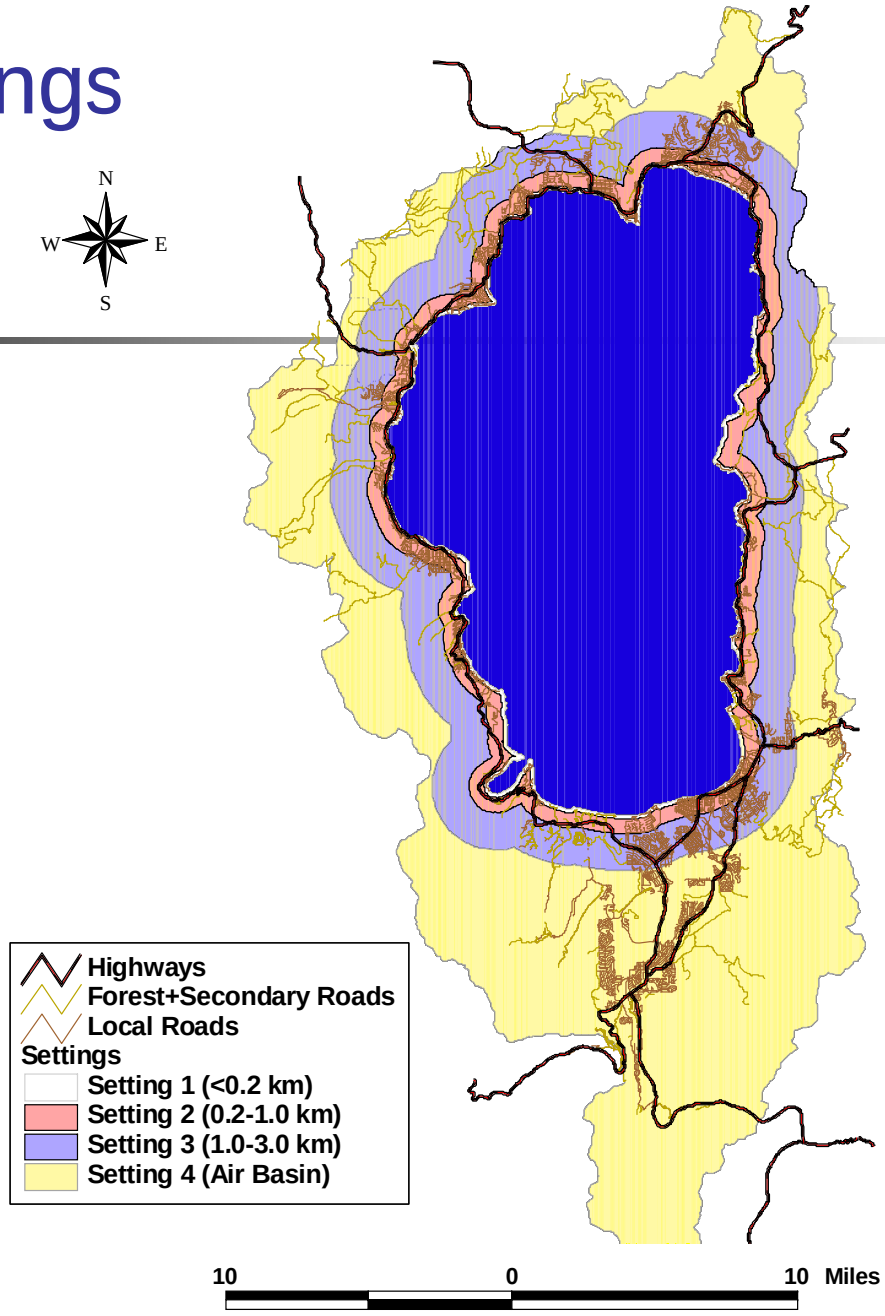
Selection Process for Control Measures

- Identify control measures applicable for the basin
- Mobile source control measures reviewed by
  - Gordon Shaw (Transportation Working Group)
  - Earl Withycombe (CARB)
- Eliminate control measures for minor sources
- Eliminate control measures adopted since 2003 CARB Deposition Study which is the basis for the FS budget
- Eliminate control measures only enforceable at the state or federal level

Site-Scale Analysis: Importance of Settings

- Pollutant sources closer to the lake have a higher probability of reaching the lake compared to distant sources.
- Allows regulatory agencies to implement a step-wise approach for controlling pollutants by focusing on sources most likely to impact the lake.
- Settings based on spatial distribution of on-road mobile source emissions since these emissions account for largest portion of atmospheric sources of TN.

Settings


N
W
E
S
Highways
Forest+Secondary Roads
Local Roads
Settings
Setting 1 (<0.2 km)
Setting 2 (0.2-1.0 km)
Setting 3 (1.0-3.0 km)
Setting 4 (Air Basin)
10
0
10 Miles

Treatment Tiers

- Tier 3
  - Implement measures with highest control efficiencies
  - 100% penetration throughout basin
- Tier 2
  - Realistic measures in terms of costs and acceptability
  - Less than 100% penetration throughout basin
- Tier 1 (Baseline)
  - No additional new control measures

PCOs Chosen for Paved Roads

- Use of PM efficient vacuum sweepers
  - 45% reduction for weekly sweeping (Tier 3)
  - 23% reduction for biweekly sweeping (Tier 2)
- Switch from sand/cinders to deicers for snow/ice covered roads (Tiers 2 and 3)
- Pave 100’ section of unpaved road at each access point to paved road to decrease track-out (Tiers 2 and 3)

PCOs Chosen for Unpaved Roads

- Tier 3
  - Pave roads (99% reduction)
- Tier 2
  - Apply gravel for 50% of roads (46% reduction)
  - Impose 20 mph speed limit for other 50% of roads (12 % reduction)

PCOs Chosen for Bare Disturbed Areas

- Chemical dust suppressant with 84% reduction
  - Road construction (Tiers 2 & 3)
  - Building construction (Tier 3)
- 15 mph speed limit with 19% reduction (Tier 2)
- Minimum 12% soil moisture for earthmoving activities will provide 68% reduction for this phase of construction activities (Tiers 2 &3)

PCOs Chosen for On-Road Mobile Sources

- Charge daily fee for visitors driving into basin to encourage use of Park-and-Ride transit system
- Establish an extensive clean emissions mass transit system for residents and visitors

Note: EPA's 2004 regulations for non-road diesel vehicles and equipment are projected to reduce emissions from these sources by >90%

Assumptions

- Local sources account for most of the decline in lake clarity.
- Fine sediment is due to resuspended soil and elemental carbon.
- Total nitrogen load reduction equals inorganic nitrogen load reduction estimate multiplied by TN/IN ratio from deposition budget (i.e., 1.47).
- New PCOs for on-road vehicles plus EPA's non-road diesel regulations will achieve nitrogen load reduction goals for each treatment tier.

Load Reduction Estimates for Basin as Percentage of Atmospheric Dep. Budget

Pollutant	Tier 3	Tier 2
Inorganic Nitrogen	23%	9%
Fine Sediment	65%	26%
Phosphorus	61%	24%

Basin-Wide Costs and Cost Effectiveness of PCOs

Pollutant	IN		FS	
	Tier 3	Tier 2	Tier 3	Tier 2
Annual Cost ($)	368M	147M	5.7M	2.1M
Cost Effectiveness ($/MT/yr)	18M	18M	12K	10K

Visitor Fees will Offset Cost of New Transit System and Park-n-Ride Lots

- Visitor fees based on $20/day
  - Tier 3: $312M/year
  - Tier 2: $374/year
- Cost of new transit system & park-n-ride lots
  - Tier 3: $368M/year
  - Tier 2: $147M/year
- Net cost of new transit system & park-n-ride lots
  - Tier 3: $56M/year
  - Tier 2: -$227M/year